

# To play with feeling?

## The opportunity of aesthetics in computational musical creativity

Geraint A. Wiggins

AI Lab, Vrije Universiteit Brussel, Brussels, Belgium &  
Electronic Engineering & Computer Science, Queen Mary University of London, UK

*Introduction* The research field of Computational Creativity (CC) has been defined as “The philosophy, science and engineering of computational systems which, by taking on particular responsibilities, exhibit behaviours that unbiased observers would deem to be creative.” [3, §1] CC research is not restricted to artistic activities (e.g., mathematics is included), but artistic domains distinguish it most from conventional Artificial Intelligence (AI), partly because they position CC closer to questions about aesthetic consciousness. In this position paper, I argue for music as an object of scientific study, arguing that it is an ideal domain for both CC and machine consciousness research.

*What is music?* Music comprises many distinct aspects. Babbitt [1] proposes three representational domains for music: *graphemic* (notated); *acoustic* (physical); *auditory* (cognitive). Affective response resides in the auditory domain.

Babbitt’s domains help describe musical operations [13]. The auditory is privileged: absent musical intelligence, moving from the graphemic to the acoustic entails literal recording and playback. Where a human is involved, the auditory mediates: performing a musical score entails cognition [13, 12]. From a CC perspective, excluding the auditory entails triviality.

Further, music’s syntactic forms are *defined* and *constructed* by perceptual and cognitive processes [13, 12, 14]: listening and memory. Musical syntax is complex, multidimensional, and deeply hierarchical. Music uses reference in ways similar to anaphora in language. But music is usually self-contained: it hardly ever refers directly to things that are non-musical.

*What does music mean?* Syntactic features of music have direct psychomotor effects: music makes people want to move—but the effect is subtle, and related to timing in language [8, 6]. Humans enjoy and actively seek the engagement out, even when the emotion is (superficially) negative [9]. We distinguish between affect *suggested* to, and affect *felt* by, a listener [11]; music suggests an interesting ability to be affected by something and to simultaneously reflect on that effect.

Music differs from language, in that it has no propositional, compositional semantics: it makes no statements *about the world*. It is thus a closed system, referring to itself [4], conveying affective connotation, but not epistemic content.

*Consciousness* Therefore, music affords a unique opportunity to study cognitive effects that are directly related to conscious experience, without the baggage of general knowledge that cognitive science generally carries. Specifically,

- syntactic effects seem to engage entrainment and thus affective response [6];
- syntactic and semiotic effects seem to directly engage affective response [5];
- powerful expectations are generated, which are sometimes describable by conscious awareness, and which engage affective response [10];

- conscious and non-conscious awareness of the meta-level seems commonplace: dynamic expectation is a major factor in musical experience [8, 7].

Relatively little work on music is available in machine consciousness studies [2]. Such work would be a true symbiosis: music affords a purpose-built laboratory in which consciousness studies can cut directly to the mechanisms; consciousness studies afford detailed understanding of aesthetics (qua “feelings”) which are not normally available for consideration in music theory.

## References

1. Babbitt, M.: The use of computers in musicological research. *Perspectives of New Music* **3**(2), 74–83 (1965)
2. Chella, A.: A cognitive architecture for music perception exploiting conceptual spaces. In: *Applications of Conceptual Spaces: The Case for Geometric Knowledge Representation*, pp. 187–203. No. 359 in Synthese Library, Springer (2015)
3. Colton, S., Wiggins, G.A.: Computational creativity: The final frontier? In: de Raedt, L., Bessiere, C., Dubois, D., Doherty, P. (eds.) *Proceedings of ECAI Frontiers* (2012). <https://doi.org/10.3233/978-1-61499-098-7-21>
4. Deliège, I.: Grouping conditions in listening to music: An approach to Lerdahl and Jackendoff’s grouping preference rules. *Music Perception* **4**, 325–360 (1987)
5. Egermann, H., Pearce, M.T., Wiggins, G.A., McAdams, S.: Probabilistic models of expectation violation predict psychophysiological emotional responses to live concert music. *Cognitive, Affective, & Behavioral Neuroscience* **13**(3), 533–553 (2013). <https://doi.org/10.3758/s13415-013-0161-y>  
<http://dx.doi.org/10.3758/s13415-013-0161-y>
6. Forth, J., Agres, K., Purver, M., Wiggins, G.A.: Entraining IDyOT: timing in the information dynamics of thinking. *Frontiers in Psychology* **7**, 1575 (2016). <https://doi.org/10.3389/fpsyg.2016.01575>
7. Gingras, B., Pearce, M.T., Goodchild, M., Dean, R.T., Wiggins, G., McAdams, S.: Linking melodic expectation to expressive performance timing and perceived musical tension. *Journal of Experimental Psychology: Human Perception and Performance* **42**(4), 594 (2016)
8. Huron, D.: *Sweet Anticipation: Music and the Psychology of Expectation*. Bradford Books, MIT Press, Cambridge, MA (2006)
9. Juslin, P., Sloboda, J.: *Handbook of music and emotion: theory, research, applications*. Affective Science, Oxford University Press (2010)
10. Pearce, M.T., Wiggins, G.A.: Auditory expectation: The information dynamics of music perception and cognition. *Topics in Cognitive Science* **4**(4), 625–652 (2012). <https://doi.org/10.1111/j.1756-8765.2012.01214.x>
11. Wiggins, G.A.: Music, syntax, and the meaning of “meaning”. In: *Proceedings of the First Symposium on Music and Computers*. pp. 18–23. Ionian University, Corfu, Greece (1998)
12. Wiggins, G.A., Müllensiefen, D., Pearce, M.T.: On the non-existence of music: Why music theory is a figment of the imagination. *Musicae Scientiae Discussion Forum* **5**, 231–255 (2010)
13. Wiggins, G.A.: Semantic Gap?? Schemantic Schmap!! Methodological considerations in the scientific study of music. In: *Proceedings of 11th IEEE International Symposium on Multimedia*. pp. 477–482 (2009). <https://doi.org/10.1109/ISM.2009.36>
14. Wiggins, G.A.: Music, mind and mathematics: Theory, reality and formality. *Journal of Mathematics and Music* **6**(2), 111–123 (2012)